

Borehole

**21-01-01****Log Event A****Borehole Information**

Farm : <u>BX</u>	Tank : <u>BX-101</u>	Site Number : <u>299-E33-144</u>
N-Coord : <u>45,430</u>	W-Coord : <u>53,220</u>	TOC Elevation : <u>656.29</u>
Water Level, ft :	Date Drilled : <u>7/31/1970</u>	

**Casing Record**

Type : <u>Steel-welded</u>	Thickness, in. : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

**Borehole Notes:**

Borehole 21-01-01 was drilled in July 1970 to a depth of 100 ft using 6-in. casing. A starter casing of unknown dimensions was installed to a depth of about 12 ft; it is unknown whether the starter casing was removed. The drilling report does not indicate that the borehole casing was perforated or grouted. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing. The top of the casing, which is the zero reference for the SGLS, is approximately 0.5 ft below the ground surface.

**Equipment Information**

Logging System : <u>1B</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>02/1997</u>	Calibration Reference : <u>GJO-HAN-13</u>	Logging Procedure : <u>P-GJPO-1783</u>

**Log Run Information**

Log Run Number : <u>1</u>	Log Run Date : <u>05/07/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>99.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>31.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>2</u>	Log Run Date : <u>05/08/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>0.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>18.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>3</u>	Log Run Date : <u>05/08/1997</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>17.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>R</u> Shield : <u>N</u>
Finish Depth, ft. : <u>22.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Borehole

**21-01-01****Log Event A**

Log Run Number :	<u>4</u>	Log Run Date :	<u>05/08/1997</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>21.0</u>	Counting Time, sec.:	<u>100</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>32.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Log Run Number :	<u>5</u>	Log Run Date :	<u>05/08/1997</u>	Logging Engineer:	<u>Alan Pearson</u>
Start Depth, ft.:	<u>60.0</u>	Counting Time, sec.:	<u>100</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>45.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

### Analysis Information

Analyst : S.D. BarryData Processing Reference : MAC-VZCP 1.7.9Analysis Date : 07/08/1997

### Analysis Notes :

This borehole was logged by the SGLS in five log runs, including one section that was relogged for quality assurance purposes. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from these spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137, Co-60, Sb-125, processed uranium, and Eu-154 were detected around this borehole. The presence of Cs-137 was measured continuously from the ground surface to a depth of 25.5 ft. Alternating zones of intermittent and continuous Cs-137 contamination were detected from 26 ft to the bottom of the logged interval (99 ft). The presence of Co-60 was detected almost continuously from 20.5 to 74 ft and 87 to 96 ft. Sb-125 was measured almost continuously from 27 to 32.5 ft and 38.5 to 41.5 ft. Alternating zones of intermittent and continuous processed uranium were detected from 74.5 to 92.5 ft. The presence of Eu-154 was detected from 20 to 46 ft.

The K-40 concentrations increase at about 40 ft. It was not possible to identify many of the 609-keV peaks used to derive the U-238 concentrations between about 15 and 45 ft. This occurred because high gamma-ray activity associated with the nearby Cs-137 (661 keV), Co-60 (1173 keV), and Eu-154 (1274 keV) peaks created an elevated Compton continuum extending to the 609-keV region, causing the MDL to exceed the measured U-238 concentration.

The interval between 45 and 60 ft was relogged as a quality assurance measure. The concentration values of both log runs for the Co-60 and natural radionuclides were plotted. The calculated concentration values were well within the statistical error range and showed the excellent repeatability of the system.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 and Co-60 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.



## Spectral Gamma-Ray Borehole Log Data Report

Page 3 of 3

Borehole

# 21-01-01

Log Event A

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks BX-101 and BX-102.

### **Log Plot Notes:**

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A rerun plot was generated for the region between 45 and 60 ft. The radionuclide concentrations shown were calculated using the separate data sets provided by the original and rerun logging runs.

Plots of the spectrum shape factors are included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

A time-sequence plot of the historical gross gamma log data from 1975 to 1989 is also included with the SGLS plots.